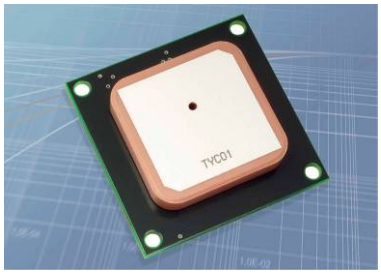
Smart GPS Antenna A1035-D

A description of Tyco Electronics'
GPS antenna module A1035-D

User's Manual - PRELIMINARY

Version 1.0
Hardware Revision 01



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Revision History

Rev.	Date	Description
1.0	07-22-05	Initial Draft – preliminary information
	mm-dd-yy	

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1 Introduction

Tyco Electronics' smart GPS antenna A1035-D is the combination of a highly integrated GPS receiver module and a ceramic GPS patch antenna. The antenna is connected to the module via an LNA. The module is capable of receiving signals from up to 20 GPS satellites and transferring them into position and timing information that can be read over a serial port. Small size and high-end GPS functionality are combined at low power consumption:

- Operable at 3.3V / 41mA (typ.) @ 1fix per second
- UART interface at CMOS level
- Small form factor of 35.6 x 35.6 mm (1.4" x 1.4")
- Standard power and I/O connector
- Mountable without solder process
- Field replaceable

The smart antenna module is available as an off-the-shelf component, 100% tested and shipped in trays.

NOTE: The module can be offered for OEM applications with adaptation in form and connection. Additionally, the antennas can be tuned to their final environment.

1.1 Label

The A1035-D's labels hold the following information:

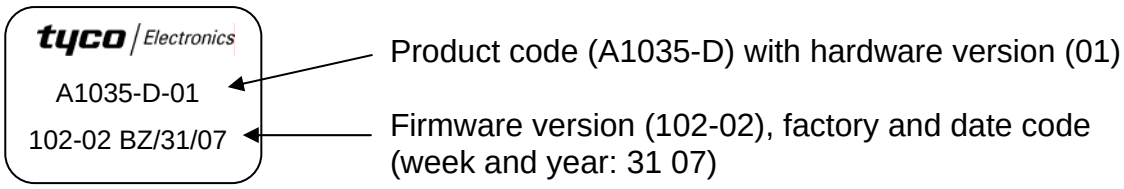


Figure 1: A1035-D labels

1.2 Characteristics

The antenna modules are characterized by the following parameters.

Channels		20, parallel tracking
Correlators		200.000 plus
Frequency		L1 (= 1575 MHz)
Tracking Sensitivity		-159dBm
Position Accuracy	Stand alone	< 10m CEP (SA off)
Time To First Fix – TTFF (theoretical minimum values; values in real world may differ)	Obscuration recovery (1)	0.1s
	Hot start (2)	< 1s
	Warm (3)	< 32s
	Cold (4)	< 35s

Table 1: A1035-D characteristics

(1) The calibrated clock of the receiver has not stopped, thus it knows precise time (to the µs level).
(2) The receiver has estimates of time/date/position and valid almanac and ephemeris data.
(3) The receiver has estimates of time/date/position and recent almanac.
(4) The receiver has no estimate of time/date/position, and no recent almanac.

1.3 Mechanical Characteristics

Mechanical dimensions	Length Width Height	35.56mm, 1.4” 35.56mm, 1.4” 8.0mm, 0.315”
Weight		12g, 0.5oz (may vary)

Table 2: A1035-D dimensions and weight

1.4 Handling Precautions

The smart GPS antenna A1035-D is a module that is sensitive to electrostatic discharge (ESD). Please handle with appropriate care.

2 Ordering Information

2.1 GPS Receiver A1035-D

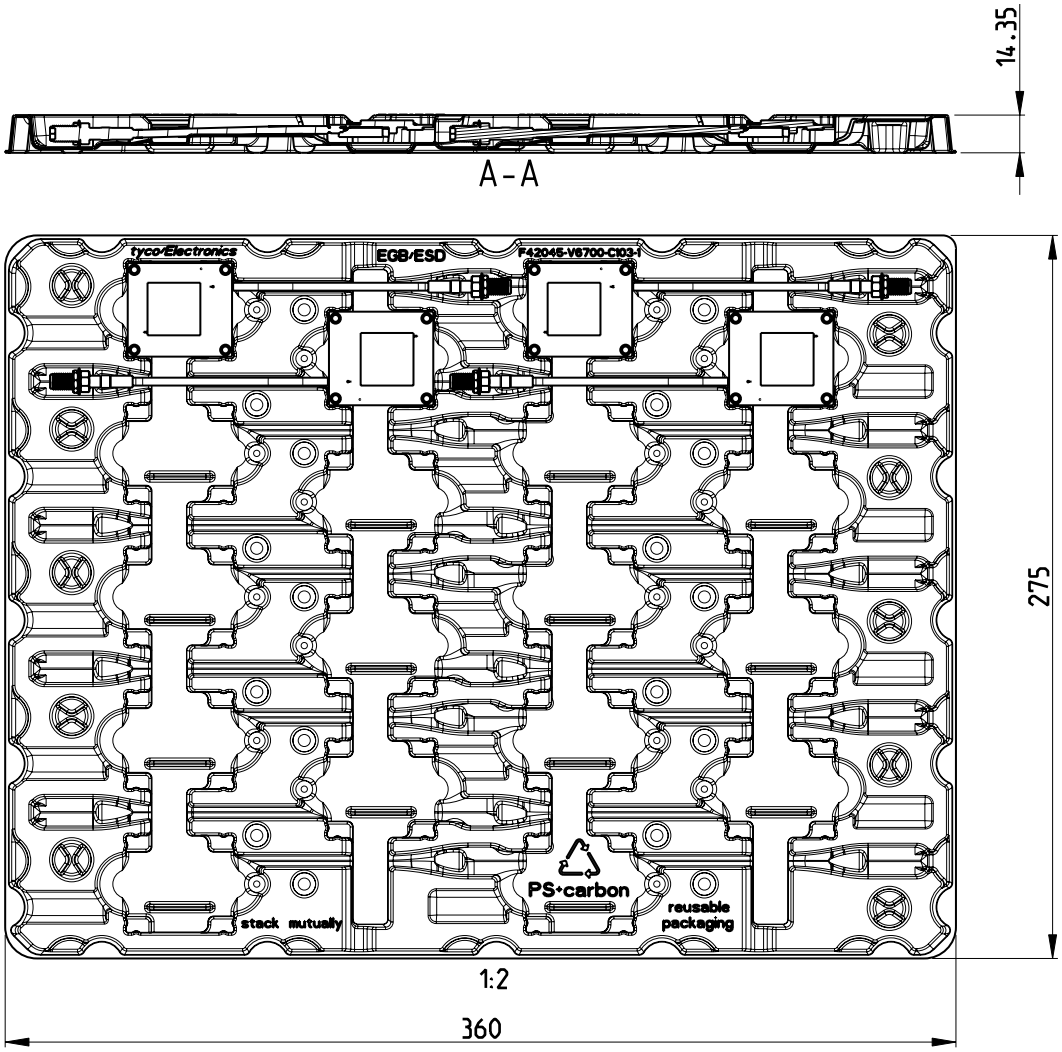
The order numbers are built as follows:

- **V23993A1035Dxxx**

V23993 stands for Tyco Electronics wireless and communication products, A1035-D for the A1035-D module. The “xxx” stands for the according firmware version. Where

2.2 Packing

The A1035-D comes in trays, with 18 modules per tray.



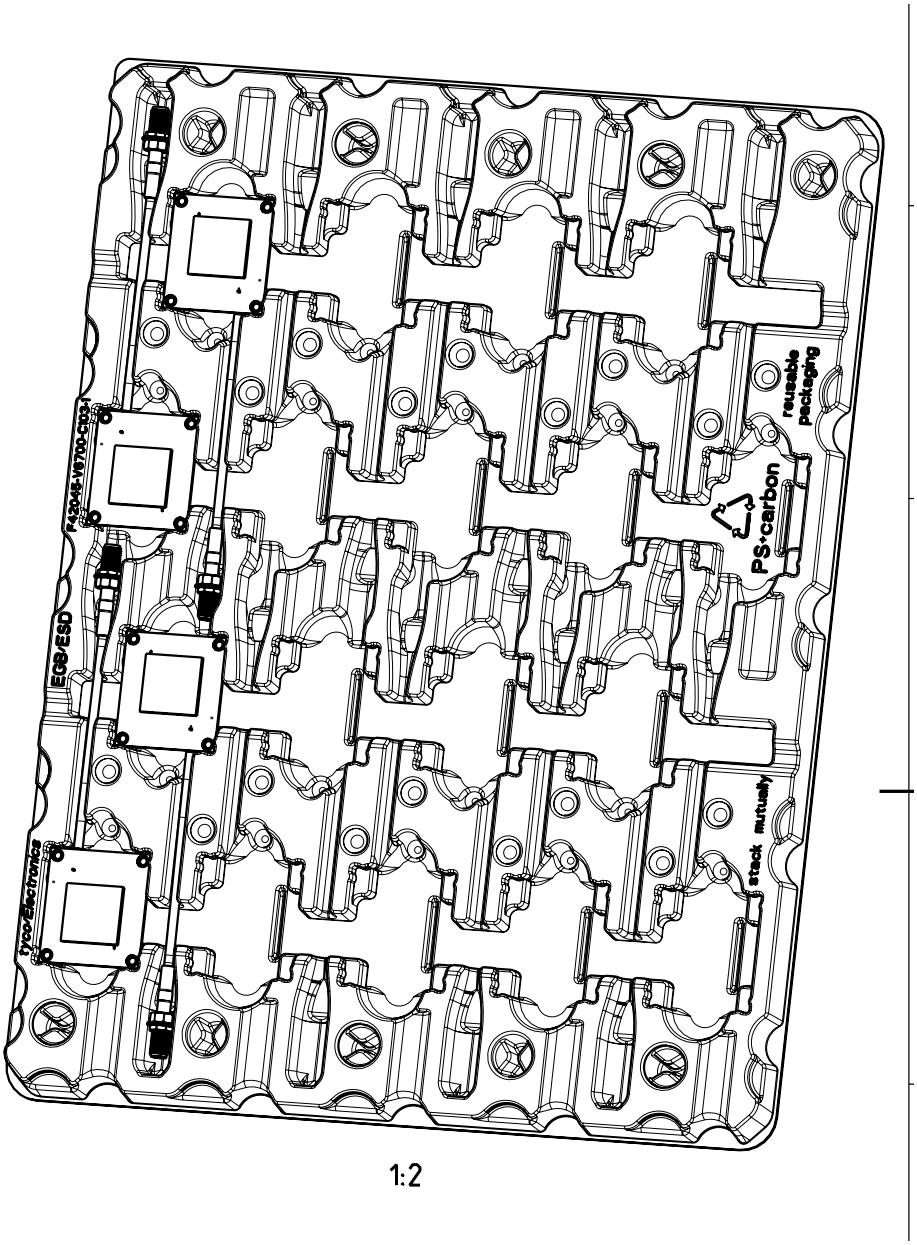


Figure 2: A1035-D tray specification

2.3 Additional Equipment

V23993DKS1035	Demonstration Kit (including one module V23993A1035D)

Table 3: Additional equipment

Detailed descriptions of the additional kits can be found in the according manuals.

3 Quick Start

In order to allow an easy and quick start with the modules A1035-D, this chapter provides a short overview on the most important steps to receive NMEA messages with position information on a serial port. For details please refer to the according chapters.

3.1 Minimum Configuration

The following picture shows a recommended minimum configuration for NMEA output and commands received and sent via an RS232 interface based on the A1035-D.

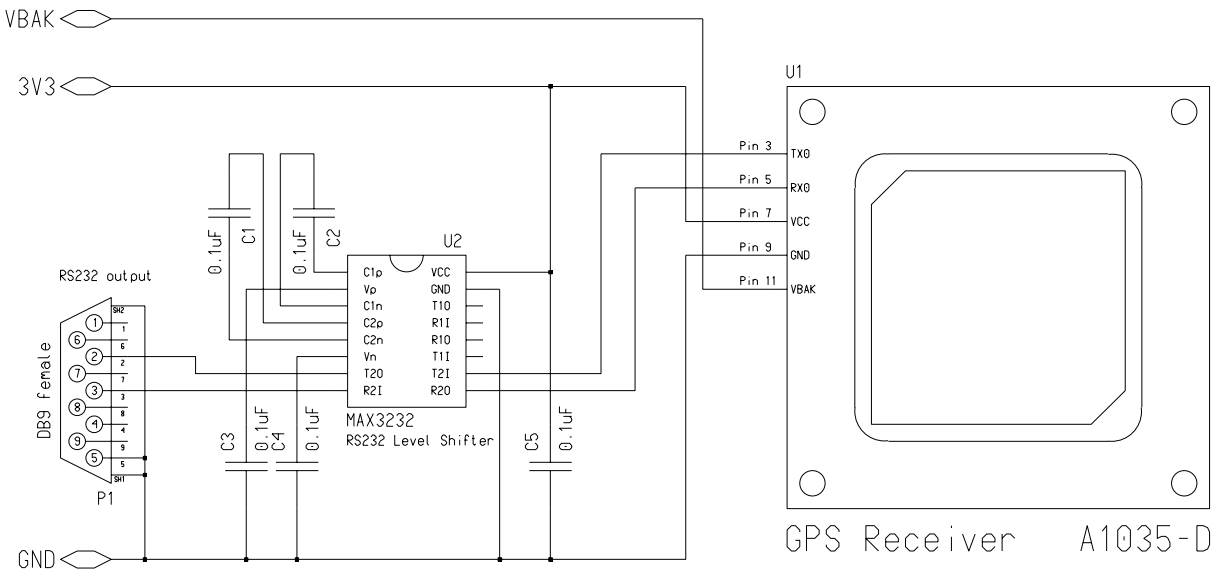


Figure 3: Recommended minimum configuration A1035-D

Remarks:

- Place C1 to C5 close to MAX3232. For capacity values see datasheet of actual component used.
- Use 3.3V level shifter (MAX3232 or equivalent).
- A battery back-up circuit for the RTC (Real Time Clock) should be considered (see below)!

3.2 Serial Port Settings

The default configuration within the standard GPS firmware is:

- Serial 0 (NMEA) 4800 baud, 8 data bits, no parity, 1 stop bit, no flow control

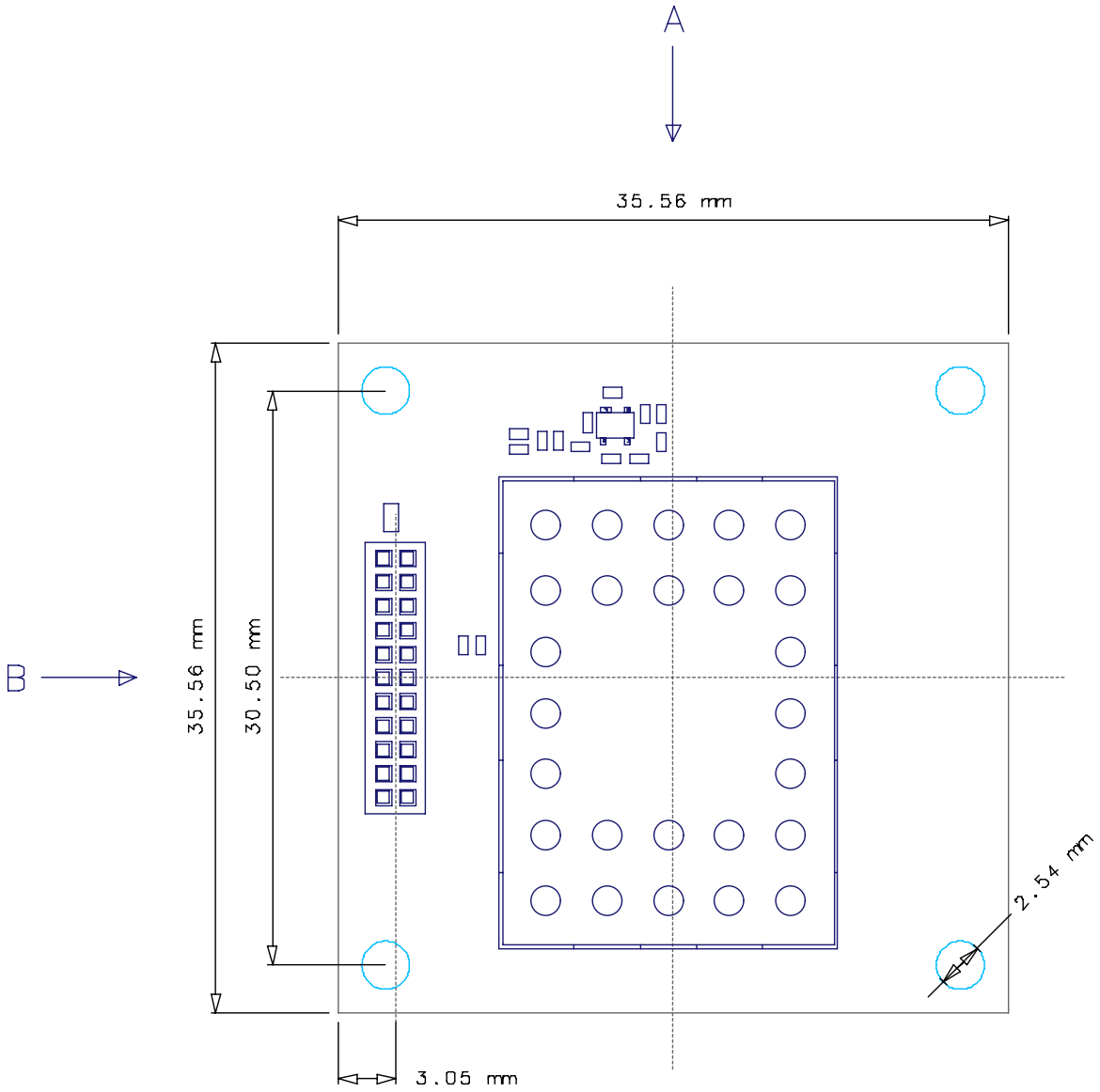
3.3 Improved TTFF

In order to improve the TTFF (Time To First Fix), it is recommended to support the RTC with a back-up power when no system power is available.

If the system or the GPS receiver alone should not be backed-up it is possible to support the restart procedure by providing position and date/time information to the module. This is described in the firmware manual. Please refer there to chapter “Start-up Support” in the document T.E. GPS Firmware A1080.

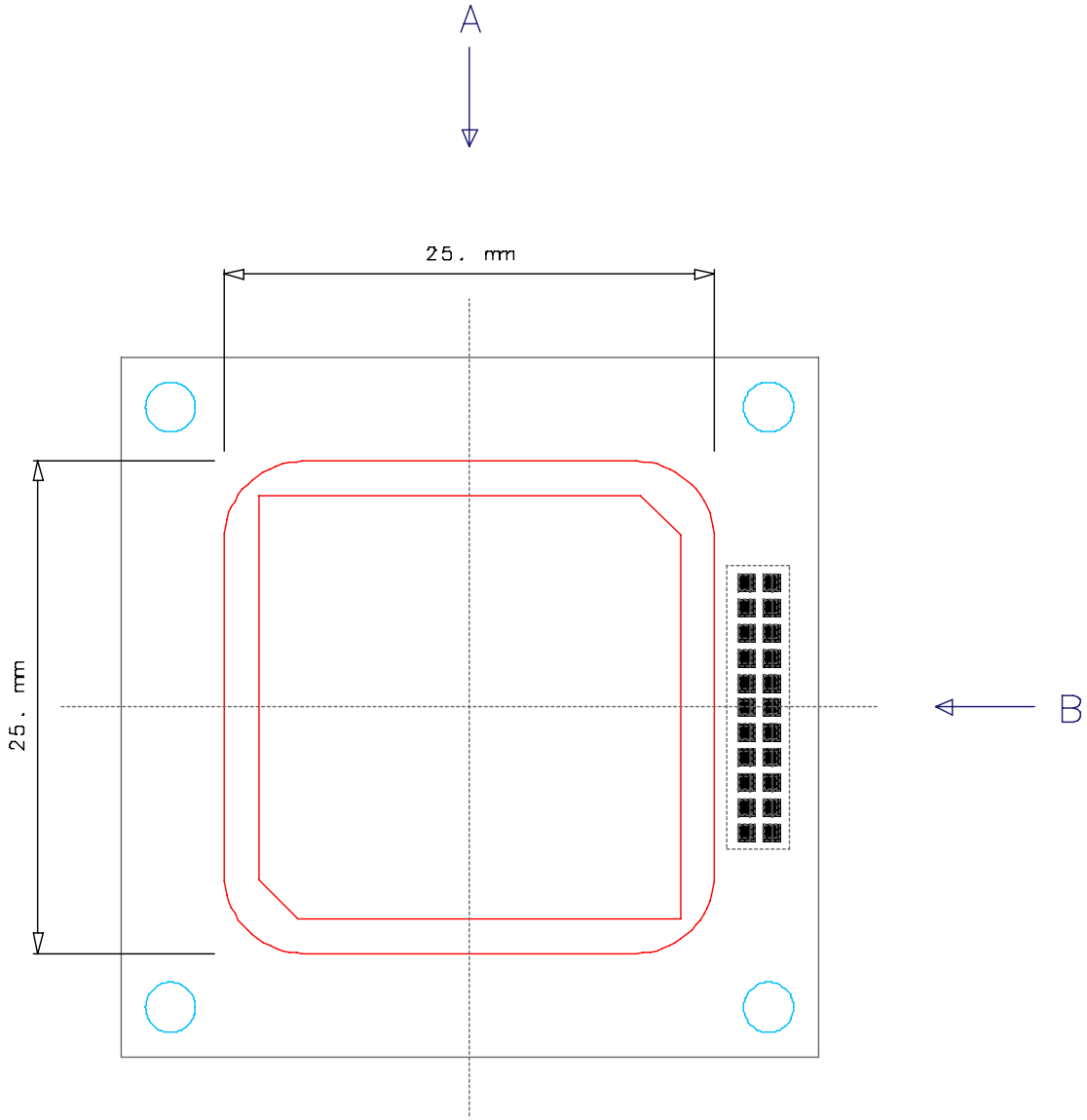
4 Mechanical Outline

4.1 Overview A1035-D



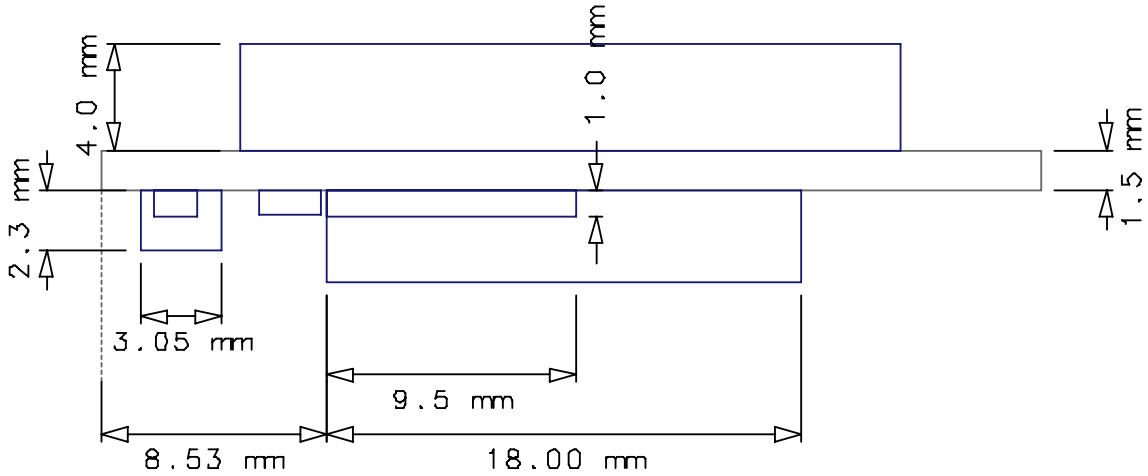
All dimensions in [mm]

Figure 4: Mechanical outline overview A1035-D (bottom)



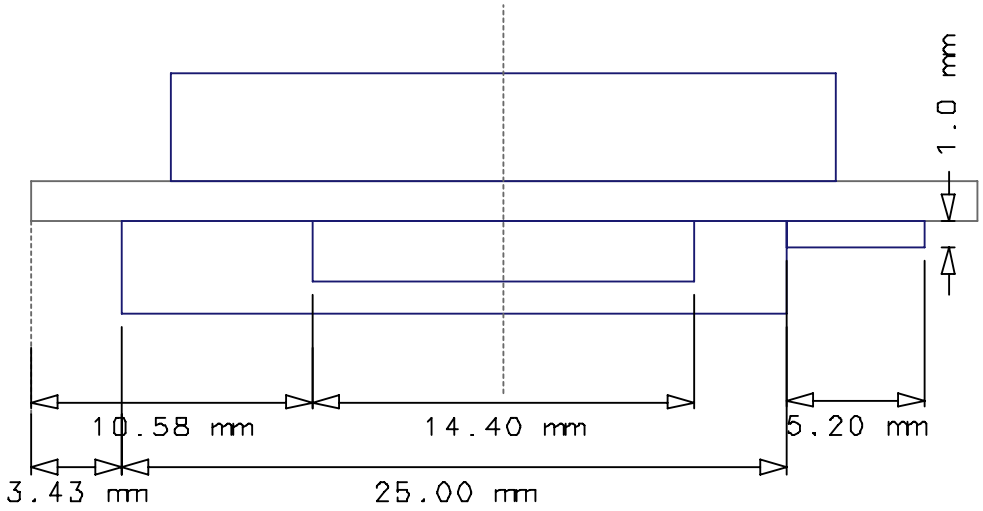
All dimensions in [mm]

Figure 5: Mechanical outline overview A1035-D (top)



All dimensions in [mm]

Figure 6: Mechanical outline overview A1035-D (side A)



All dimensions in [mm]

Figure 7: Mechanical outline overview A1035-D (side B)

Attention: The height of the module and the antenna dimensions and position might change for series production!

4.2 Connector A1035-D

The power and I/O connector used on the A1035-D is a 1.27mm (0.05”) low profile, double row socket with a height of 2.21mm (.087”) and a total of 22 contacts. Potential counterparts on the motherboard are e.g. Samtec 1.27mm (0.05”) micro strips of the FTS series (e.g. FTS-122-02-L-D).

5 Pin-out Information

5.1 Layout A1035-D

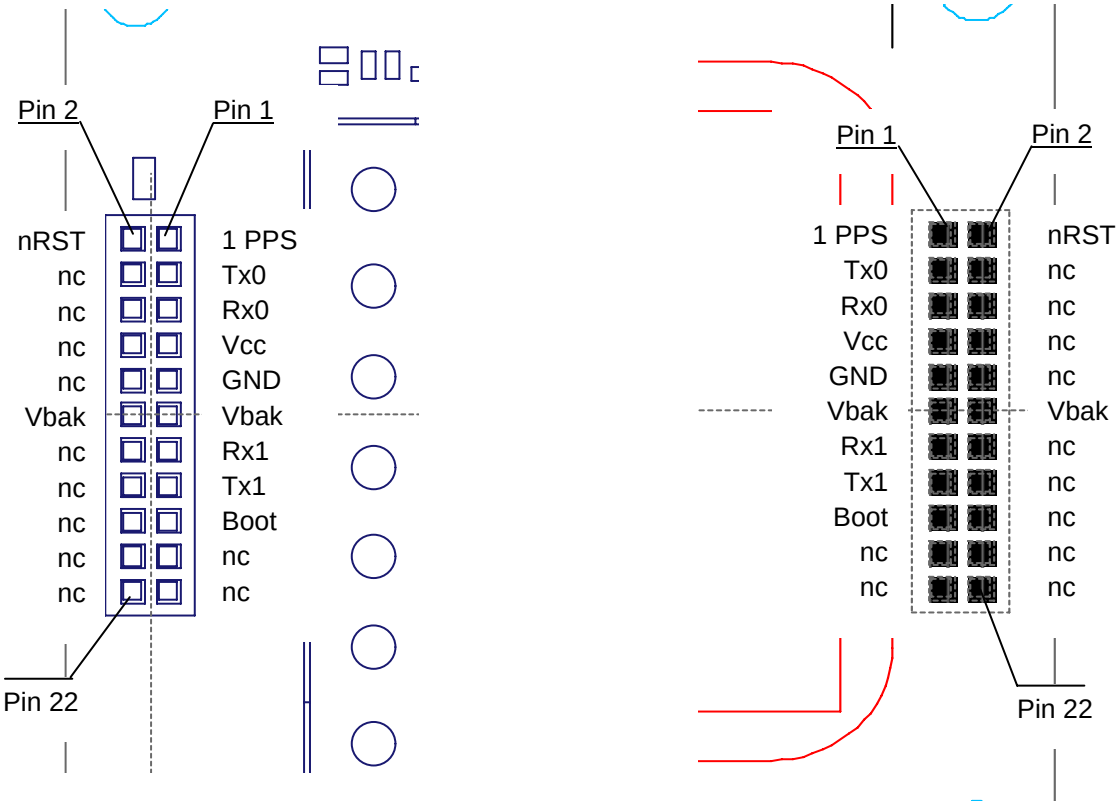


Figure 8: Pin out information A1035-D (bottom and top view)

Bottom view is showing the side of the module that will face the carrier board.

5.2 Description A1035-D Signals

This table describes the functionality of the pins and their associated symbols.

Pin	Symbol	Description
1	1 PPS	1PPS (pulse per second) output
3	TX0	Serial output 0, NMEA out
5	RX0	Serial input 0, NMEA in
7	Vcc	+3.3V (power supply option)
9	GND	Ground (power supply)
11	Vbak	Back-up pin of module for “supercap” or battery (Please see chapter 9.2 Battery Back up)
13	Rx1	Serial input 1 – reserved for binary in (leave open)
15	Tx1	Serial output 1 – reserved for binary out (leave open)
17	Boot	Special boot mode – leave open for normal operation
19	nc	Not connected
21	nc	Not connected

Table 4: Pin description A1035-D (part 1)

Pin	Symbol	Description
2	nRST	Reset input (negative)
4	nc	Not connected
6	nc	Not connected
8	nc	Not connected
10	nc	Not connected
12	Vbak	Back-up pin of module for “supercap” or battery (Please see chapter 9.2 Battery Back up)
14	nc	Not connected
16	nc	Not connected
18	nc	Not connected
20	nc	Not connected
22	nc	Not connected

Table 5: Pin description A1035-D (part 2)

5.3 General Comments

The following comments should be considered for a design with and use of the module:

- Standard configuration of serial port:
  Serial 0 (NMEA) 4800 baud, 8 data bits, no parity, 1 stop bit, no flow control

6 Electrical Characteristics

6.1 Operating Conditions

Pin	Description	Min	Typical	Max
7	V_{cc}	3.0V	3.3V	3.6V
	Peak Acquisition Current (1)		57mA	
	Average Acquisition Current (2)		41mA	
	Tracking Current (3)		36mA	
	Standby Current (4)		20µA	

Table 6: Operating Conditions

6.2 Absolute Maximum Ratings

Pin	Description	Min	Max
9	Vcc	-0.3V	3.6V
	Applied voltage to all input pins excluding Vcc	-0.3V	Vcc+0.3V max. 3.6V

Table 7: Absolute maximum ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

7 Mounting

The A1035-D offers a power and I/O connector with a 1.27mm (0.05”) low profile, double row socket with a total of 22 contacts. Potential counterparts on the motherboard are Samtec 1.27mm (0.05”) micro strips of the FTS series. For fixing the A1035-D on a motherboard appropriate screws and bolts or clips (see also chapter 4 Mechanical Outline) are recommended.

8 Quality and Reliability

8.1 Environmental Conditions

Operating temperature	- 30 … + 85°C
Operating humidity	Max. 85% r. H., non-condensing, at 85°C
MSL JEDEC (Moisture Sensitivity Level)	3
Storage	6 months in original package.

Table 8: Environmental conditions

8.2 Product Qualification

Prior to product qualification the GPS receiver is preconditioned according to EIA/JEDEC standard JESD22-A113-B / Level 3.

Basic qualification tests:

- MSL Classification according to J-STD-020C (MSL3 @ 245°C)
- MSL Rework Compatibility according to J-STD-020C
- Temperature Cycling –30°C … +85°C
- Temperature Humidity Bias 70°C / 85% RH
- High / Low Temperature Operating –30° / +85°C
- High Temperature Operating Life +85°C
- Vibration Variable Frequency
- Mechanical Shock

Please contact Tyco Electronics for detailed information.

8.3 Production Test

Each module is electrically tested prior to packing and shipping to ensure state of the art GPS receiver performance and accuracy.

9 Applications and Hints

9.1 Minimum Configuration

Please refer to chapter 3.1 Minimum Configuration for details. In addition, for optimized start-up behavior it is strongly recommended to add a battery back-up circuit (see chapter 3.3)!

9.2 Battery Back-up

This application note describes on how to back-up the RTC and the SRAM of the GPS receiver module. The basic of the first examples is to provide a back-up by a separate battery or a “supercap”.

While the “supercap” is charged thru the module during normal operation, the battery (primary cell) is decoupled thru a diode!

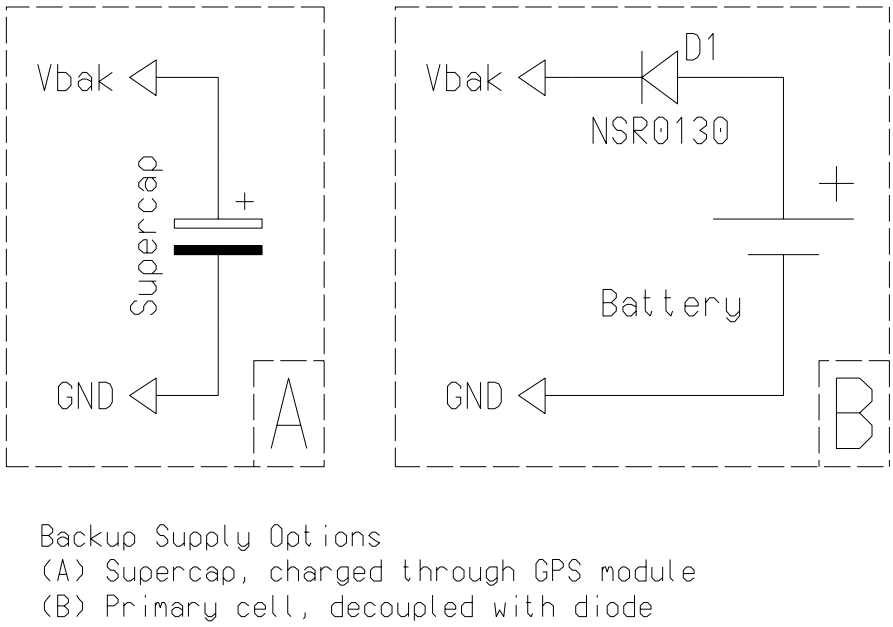


Figure 9: Application note: Module back-up

An alternative to this solution is to switch the supply voltage from the Vcc pin to the Vbak pin. Care needs to be taken that the there is no voltage outage during the switch-over phase!

9.3 1PPS pin (1 pulse per second pin)

The 1PPS pin is an output pin.

In addition to precise positioning, GPS also allows for accurate timing due to the synchronized atomic clocks in the GPS satellites. While the current date and time is transmitted in NMEA sentences, an exact and accurate timing signal is provided via the 1PPS pin of the A1080 modules.

9.4 Reset Signal

The nRST pin is an input pin.

The nRST pin can be used to generate a reset on the A1080-A module. Resetting the module will result in a restart of the complete firmware. All information stored in SRAM will still be valid.

10 Demonstration Kits

10.1 Demonstration Kit A1035

For demonstration and easy evaluation of GPS performance Tyco Electronics offers a Demonstration Kit (including one smart GPS antenna A1035-D). It shows two serial interfaces, but only one is being used (NMEA). The Demonstration Kit can be powered by an external 5 to 12V source. Accompanied by a serial cable it offers a ready-to-go set. For further information please contact Tyco Electronics.

11 Related Information

11.1 Contact

This manual was created with due diligence. We hope that it will be helpful to the user to get the most out of the GPS module.

Anyway, inputs about errors or mistakable verbalizations and comments or proposals to TYCO Electronics, Power Systems in Munich, Germany, for further improvements are highly appreciated.

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12 Related Documents

- Manual: T.E. GPS Firmware A1080-A (TYCO)
- Manual: T.E. GPS DemoKit DKS1035 (TYCO)
- Manual: T.E. GPS Receiver A1080 V2.3.doc (TYCO)
- Application note: GPS AN A1080-A – EDLC as Backup Supply V1.0 (TYCO)
- Application note: GPS AN A1080-A – Backup V1.0 (TYCO)

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